

μA727

TEMPERATURE-CONTROLLED DIFFERENTIAL PREAMPLIFIER

FAIRCHILD LINEAR INTEGRATED CIRCUITS

FEATURES

- VERY LOW OFFSET DRIFTS
- HIGH INPUT IMPEDANCE
- WIDE COMMON MODE RANGE

GENERAL DESCRIPTION — The μA727 is a monolithic, fixed gain, differential-input differential-output amplifier, constructed with the Fairchild Planar[®] epitaxial process, mounted in a high thermal-resistance package, and held at constant temperature by active regulator circuitry. The high gain and low standby dissipation of the regulator circuit give tight temperature control over a wide ambient temperature range. The device is intended for use as a self-contained input stage in very low-drift DC amplifiers, replacing complex chopper-stabilized amplifiers in such applications as thermo-couple bridges, strain gage transducers, and A to D converters.

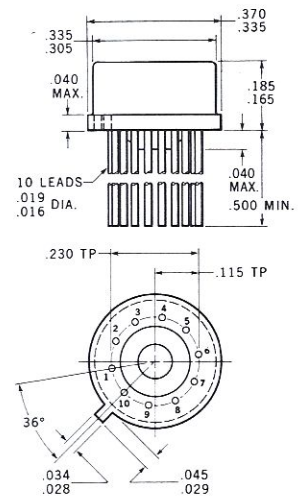
ABSOLUTE MAXIMUM RATINGS

Operating Temperature Range
Storage Temperature Range
Lead Temperature (Soldering, 60 second time limit)
Supply Voltage (Amplifier and Heater)
Differential Input Voltage
Common Mode Input Voltage

−55°C to +125°C
−65°C to +150°C
300°C
±18 V
±10 V
±15 V

PHYSICAL DIMENSIONS

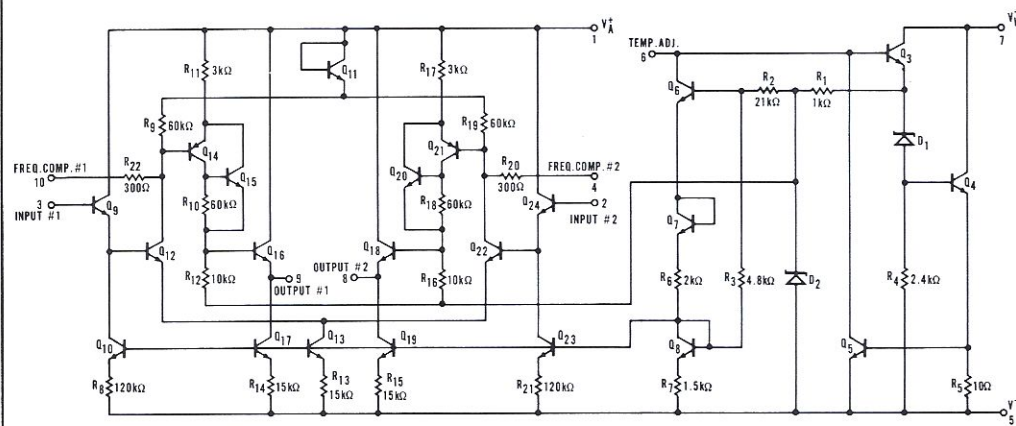
(In accordance with JEDEC TO-100)



NOTES: All dimensions in inches
Leads are gold-plated Kovar
Package weight is 1.32 grams

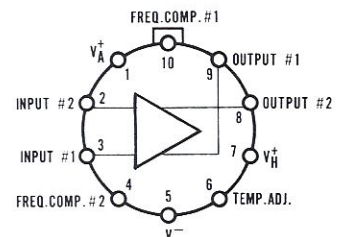
ORDER PART NO. U5J7727312

SCHEMATIC DIAGRAM



CONNECTION DIAGRAM

(Top View)



*Planar is a patented Fairchild process.

313 FAIRCHILD DRIVE, MOUNTAIN VIEW, CALIFORNIA, (415) 962-5011, TWX: 910-379-6435

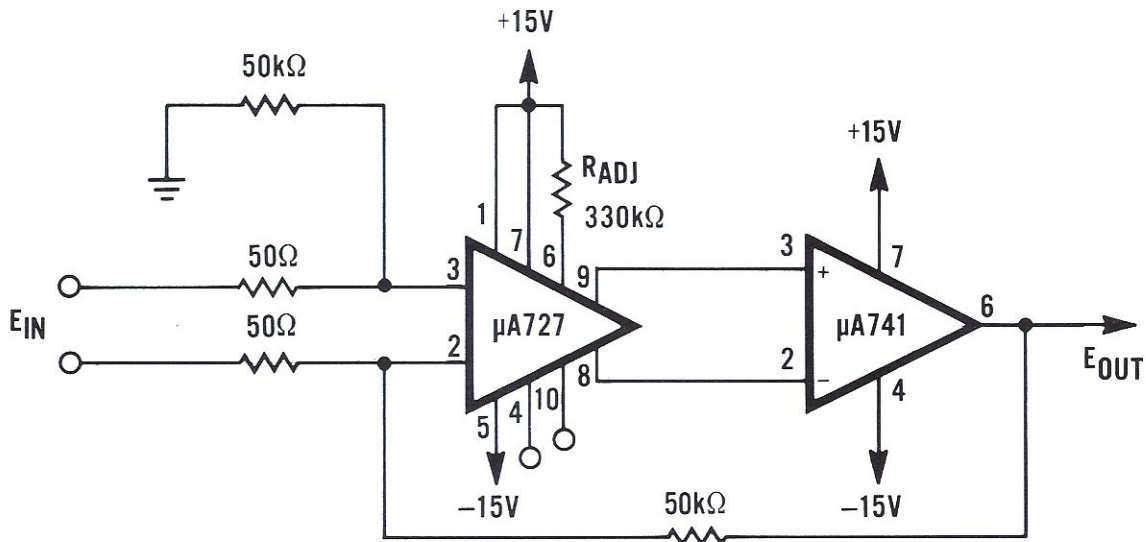
FAIRCHILD
SEMICONDUCTOR
A DIVISION OF FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

FAIRCHILD LINEAR INTEGRATED CIRCUITS μ A727

ELECTRICAL CHARACTERISTICS ($-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$, $V_H = V_A = +15\text{ V}$, $V^- = -15\text{ V}$,
 $R_{\text{ADJ}} = 330\text{ k}\Omega$, unless otherwise specified)

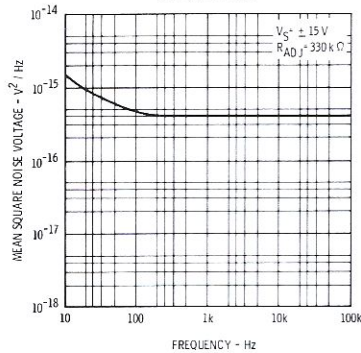
PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Offset Voltage	$R_S \leq 50\ \Omega$		2.0	10	mV
Input Offset Current			2.5	15	nA
Input Bias Current			12	40	nA
Input Offset Voltage Drift	$R_S \leq 50\ \Omega$, $+25^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$		0.6	1.5	$\mu\text{V}/^{\circ}\text{C}$
	$R_S \leq 50\ \Omega$, $-55^{\circ}\text{C} \leq T_A \leq +25^{\circ}\text{C}$		0.6	1.5	$\mu\text{V}/^{\circ}\text{C}$
Input Offset Current Drift	$+25^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$		2.0		$\text{pA}/^{\circ}\text{C}$
	$-55^{\circ}\text{C} \leq T_A \leq +25^{\circ}\text{C}$		2.0		$\text{pA}/^{\circ}\text{C}$
Input Bias Current Drift	$-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$		15		$\text{pA}/^{\circ}\text{C}$
Differential Input Resistance			300		$\text{M}\Omega$
Common Mode Input Resistance			1000		$\text{M}\Omega$
Input Voltage Range		± 12	± 13		V
Supply Voltage Rejection Ratio	$R_S \leq 100\text{ k}\Omega$		80		$\mu\text{V}/\text{V}$
Common Mode Rejection Ratio	$R_S \leq 100\text{ k}\Omega$	80	100		dB
Output Resistance			1.0	4.0	$\text{k}\Omega$
Output Common Mode Voltage		-6.0	-5.0	-4.0	V
Differential Output Voltage Swing		± 5.0	± 7.0	± 10	V
Output Sink Current		10	30	80	μA
Differential Load Rejection			5.0	10	$\mu\text{V}/\mu\text{A}$
Differential Voltage Gain		60	100	250	
Low Frequency Noise	$\text{BW} = 10\text{ Hz to } 500\text{ Hz}$, $R_S \leq 50\ \Omega$		3.0		μVrms
Long Term Drift	$R_S \leq 50\ \Omega$		5.0		$\mu\text{V}/\text{week}$
Amplifier Supply Current	$T_A = +25^{\circ}\text{C}$		1.0	2.0	mA
Heater Supply Current	$T_A = +25^{\circ}\text{C}$		10	15	mA

TYPICAL X1000 CIRCUIT

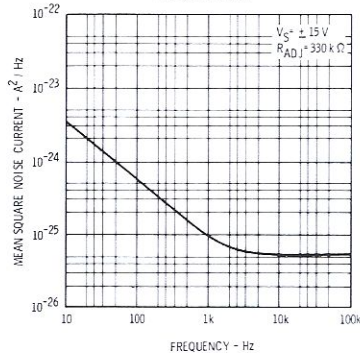


TYPICAL PERFORMANCE CURVES

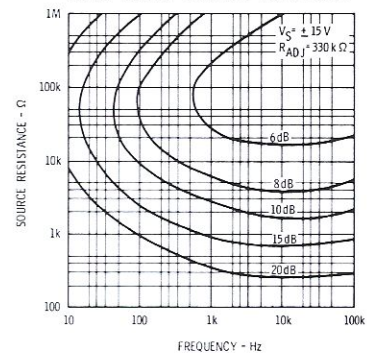
NOISE VOLTAGE
AS A FUNCTION OF
FREQUENCY



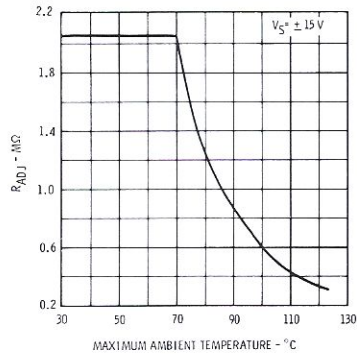
NOISE CURRENT
AS A FUNCTION OF
FREQUENCY



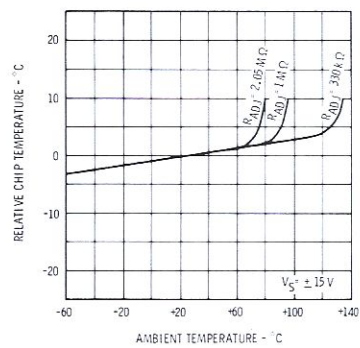
SPOT NOISE FIGURE CONTOURS



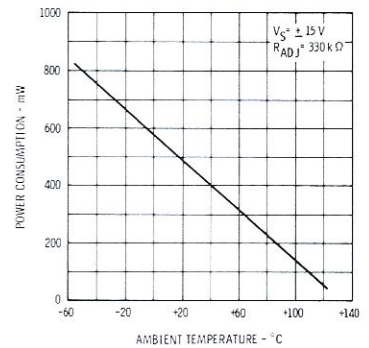
RECOMMENDED R_{ADJ} AS A
FUNCTION OF MAXIMUM
AMBIENT TEMPERATURE



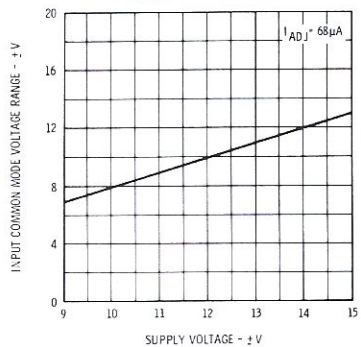
RELATIVE CHIP TEMPERATURE
AS A FUNCTION OF
AMBIENT TEMPERATURE



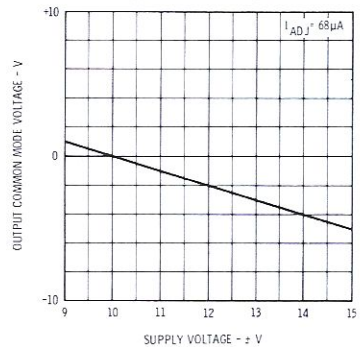
POWER CONSUMPTION
AS A FUNCTION OF
AMBIENT TEMPERATURE



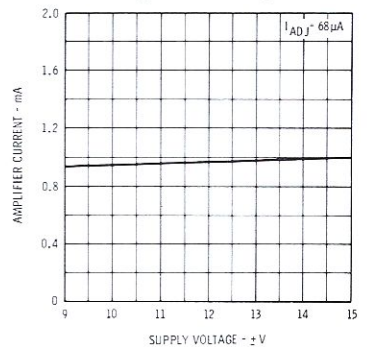
INPUT COMMON MODE VOLTAGE
RANGE AS A FUNCTION OF
SUPPLY VOLTAGE



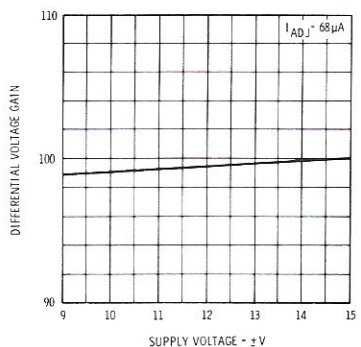
OUTPUT COMMON MODE
VOLTAGE AS A FUNCTION OF
SUPPLY VOLTAGE



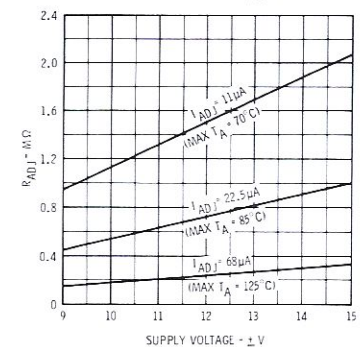
AMPLIFIER CURRENT
AS A FUNCTION OF
SUPPLY VOLTAGE



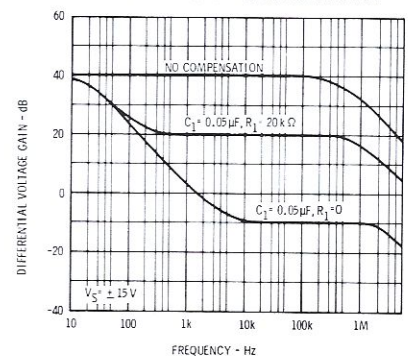
DIFFERENTIAL VOLTAGE GAIN
AS A FUNCTION OF
SUPPLY VOLTAGE



REQUIRED R_{ADJ} FOR CONSTANT
 I_{ADJ} AS A FUNCTION OF
SUPPLY VOLTAGE



OPEN-LOOP FREQUENCY
RESPONSE FOR VARIOUS
VALUES OF COMPENSATION



DEFINITION OF TERMS

INPUT OFFSET VOLTAGE — That voltage which must be applied between the input terminals to obtain zero differential output voltage.

INPUT OFFSET CURRENT — The difference in the currents into the two input terminals with the differential output at zero.

DIFFERENTIAL INPUT RESISTANCE — The resistance looking into either input terminal with the other grounded.

COMMON MODE INPUT RESISTANCE — The resistance looking into both inputs tied together.

INPUT BIAS CURRENT — The average of the two input currents.

INPUT VOLTAGE RANGE — A range of voltage which, if exceeded on either input terminal, could cause the amplifier to cease functioning properly.

INPUT COMMON MODE REJECTION RATIO — The ratio of the input voltage range to the maximum change in input offset voltage over this range.

DIFFERENTIAL VOLTAGE GAIN — The ratio of the change in differential output voltage to the change in differential input voltage producing it.

DIFFERENTIAL OUTPUT VOLTAGE SWING — The peak differential output swing that can be obtained without clipping.

OUTPUT RESISTANCE — The resistance seen looking into either output terminal with the differential output at zero.

SUPPLY VOLTAGE REJECTION RATIO — The ratio of the change in input offset voltage to the change in supply voltage producing it.

OUTPUT COMMON MODE VOLTAGE — The average voltage at the two output terminals referred to ground.

OUTPUT SINK CURRENT — The maximum negative current that can be supplied by each output.

DIFFERENTIAL LOAD REJECTION — The ratio of the change in input offset voltage to the change in differential load current producing it.

I_{ADJ} — The current into terminal 6.

FREQUENCY COMPENSATION CIRCUIT

